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Farmers' perception on the effects of gum Arabic agroforestry on livelihoods in the Sahelian zone of Borno State, Nigeria

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Abstract

The study analysed farmers' perception of effects of gum Arabic agroforestry on livelihoods in the Sahelian zone of Borno state, Nigeria. Data for the study were obtained mainly through primary sources. Multi stage, purposive and random sampling techniques were employed to select 321 respondents that was used for this study. The study revealed that the most important (30.25%) farm information by respondents was radio. This was closely followed by friends and relatives representing 29.91% of the respondents in the study area. However extension agents were the least important (9.34%) source of farm information among respondents in the study area. The study indicated that the most important (29%) reason for planting gum Arabic tree was for economic reason. The result showed that the respondents' perception on improved environmental situation and improved socio-economic status had a mean score of 2.68 and 2.63 respectively implying that the respondents had an agreed perception on the effects of gum Arabic agroforestry on livelihoods. The results in also indicated that all the constraints identified by respondents had a mean score of > 2.56, implying that they had agreed to have encountered problems in the adoption of gum Arabic agroforestry in the study area. The study recommends that awareness creation should be mounted through extension education approach to enlighten the public on the skills, knowledge, techniques and benefits of the adoption of gum Arabic agroforestry in the study area. Farmers in the study area should also be encouraged to form gum Arabic agroforestry cooperatives as this will enable them to take advantage of government and non-governmental programmes, such as provision of credit facilities and technologies etc.

Keywords: Farmers' perception, Effects, Gum Arabic agroforestry, Livelihoods, Nigeria

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1. Introduction

Land use sustainability is a challenge to the people living in Sahelian environments. Problems that commonly challenge these people include desertification, poverty and low levels of investment. The gum Arabic agroforestry system is practiced as a means of restoring the soil fertility and promoting gum Arabic production (FAO, 2007).Gum Arabic based agroforestry system was recognised and considered as one of the most successful forms of natural forest management in the tropical dry lands (Bishwa, 2003), and regarded as sustainable in terms of its environmental, social and economic benefits (Franzel et al., 2001).

The population of gum Arabic species are believed to have reduced over the years, as a result of the increasing demands for fuel wood, fencing posts and overgrazing in the Sahelian zones of Nigeria (Giroh et al., 2008).There is therefore, a need to conserve the species in order to meet the increased demand for fuel wood, fodder, soil improvement through nitrogen fixation, protection of the environment and to cater for gum production, which is an important source of improved livelihoods.

Agroforestry could be defined as a dynamic, ecologically based natural resource management system which, through the integration of trees on farm and in the landscape, diversifies and sustains production for increased social, economic and environmental benefits (Mukadasi and Nbalegwa, 2008). It has been recognized as one of the strategies to introduce indigenous and exotic trees into cropping systems and impact on livelihoods of small-holder farmers in Sub-Saharan Africa, (Kwesiga et al., 2003). Risk spreading by diversification becomes essential and one important way to diversity in African Sahel has been through production of gum Arabic (Franzel et al., 2001).

The gum Arabic (*Acacia species*) is a dominant leguminous tree crop that belongs to the family *Mimosaceae*. There are over 1,100 species worldwide (Mark, 2003). However, *Acacia Senegal* and *Acacia Seyal* are the most commonly exploited species of the whole acacia family. They are of African origin and are found to a varying intensity in the gum belt of Sub-Saharan Africa. The gum Arabic trees thrive well in harsh environments. It is a drought resistant tree plant, grows well with an annual mean rainfall of 300-400 with a dry period of 9-11 months (Gambo, 2007). It equally tolerates a wide annual mean temperature of between 14°c and 43°c (Odo and Oleghe, 1988). The gum is useful in industrial applications such as food and beverages, pharmaceuticals, cosmetics and textiles. The gum tree is known to offer a number of environmental benefits, the most important include its extensive lateral root system that reduces soil erosion and run off and as a leguminous tree it fixes nitrogen which improves soil fertility (Gambo, 2007). Thus, degraded soils can be reclaimed through gum Arabic agroforestry that could improve the livelihoods of farming households.

Studies in several parts of Africa, including Nigeria have demonstrated the economic and agronomic returns of agroforestry practices (Franzel et al., 2001) and structures to retard the process of deforestation and environmental degradation have been adopted reluctantly and, even when adopted, the management and maintenance have been less than desirable. Thus despite the considerable progress in agroforestry research and dissemination, impact of agroforestry on small holders' livelihoods is generally still modest in the tropics (Mukadasi and Nabalegwa, 2008). Faced with this situation, many researchers have called for the assessment of agroforestry systems (Franzel et at., 2001; Ayuk, 1997).

Researchers have been conducted on the adoption and effects of gum Arabic agroforestry in Nigeria (Odo and Oleghe, 1988; Giro et al., 2008). However, there has not been any empirical study into the effects of gum Arabic agroforestry among farming households in the Sahelian zone of Borno State, Nigeria. This study was therefore, designed to assess the effects of gum Arabic agroforestry on the livelihoods of farming households in the Sahelian zone of Bomo State, Nigeria.

1.1. Objectives of the study

The main objective of the study was to analyse farmers' perception of the effects of gum Arabic agroforestry on livelihoods in the Sahelian zone of Borno state, Nigeria. The specific objectives were to:

i. investigate sources of farm information among the respondents;
ii. identify reasons for adoption of gum Arabic agroforestry among respondents;
iii. examine the effects of gum Arabic agroforestry on livelihoods among respondents; and,
iv. identify the problems of gum Arabic agroforestry among respondents in the study area.

2. Methodology

2.1. The Study Area

The study was carried out in the Sahelian zone of Borno state. Borno state has a land area of about 69,436 Km^2 and lies within 11^o to 14^oN and longitude 10^o to 14^oE (BOSADP, 2003). It is located in the North Eastern part of Nigeria and shares international border with the republic of Chad to the Northeast, Cameroon to the East and Southeast and Niger republic to the North. Within the country, it is bounded by Adamawa state to the South, Yobe state to the West and Gombe state to the South. The Sahelian zone is comprised of ten (10) Local Government Areas (LGAs) namely; Abadam, Gubio, Guzamala, Magumeri, Marte, Mobbar, Monguno, Nganzai, Ngala and Kukawa. This environment has a population of 1,243,068 (NPC, 2006).

2.2. Sources of Data

The data for the study were obtained through primary and secondary sources. Primary data were mainly generated from farming household through the use of structured and pre-tested interview schedules. The

secondary data comprising information from Area Extension Officers (AEOs) of the BOSADP were used to complement the primary data. Other sources of secondary information include; Textbooks, Journals, Publications and other write-ups that are relevant to this study.

2.3. Sampling Procedure and sample size

Multi stage, purposive and random sampling techniques were employed for selecting the representative farming households that will be used for this study. The Sahelian zone of Borno state comprised ten (10) LGAs. Therefore, the first stage was the purposive selection of four (4) major gum Arabic producing Local Government Areas (Magumeri, Mobbar, Guzamala and Kukawa) in the study area. The second stage of sampling was the proportionate selection of villages per Local Government Area (12 from Magumeri; 14 from Mobbar; 3 from Guzamala and 4 from Kukawa) to make a total of 33 villages sampled in the study area. The list of villages were obtained from the Area Extension Officers (AEOs) and used as sampling frame. The third stage was the random selection of ten (10) households from each of the selected villages. A total of 330 farming households were therefore, selected as the sample size for the study. However, 321 respondents were used for the analysis, because nine of the questionnaires were not properly filled.

2.4. Analytical techniques

Descriptive (frequencies, means and percentages) statistics were used to analyse the data collected for this study. Descriptive analytical techniques such as frequency distribution and percentages were used to categorize the farming households based on socio-economic characteristics and reasons for adopting gum Arabic agroforestry in the study area. The Mean Scores were measured by using a three – level scale; Likert type as used by (Bishwa, 2003). In this scale, each item was scored as follows;

Agreed (A)	(2 points)
Disagreed (DA)	(1 Points)
Undecided (U)	(0 Points)

The scores obtained by the respondents were weighted in order to get their mean. Weighted scores refer to the respondents' scores against each item multiplied by the scores under each Likert scale point. The products will be added together on each column in order to find out the average (mean) scores using the number of respondents to be involved. The mean (average) obtained were interpreted as follows:

Interpretation scale:

≤ 1.55	=	DA - Disagreed
1.56 – 2.55	=	N - Neutral
≥2.56	=	A - Agreed

Mean scores were used to determine the perceived effects of adoption of gum Arabic agroforestry on livelihoods among the farming households as used by (Daniel et al., 1996; Bishwa, 2003).

3. Results and discussion

3.1. Sources of farm information of respondents

The study revealed that the most important (30.25%) farm information by respondents was radio. This was closely followed by friends and relatives representing 29.91% of the respondents in the study area. Extension agents were the least important (9.34%) source of farm information among respondents in the study area. The implication could be that the source of farm information (radio) creates awareness on farm technologies among the respondents. However, due to the poor performance of extension agents as sources of farm information, the adoption of technologies among the respondents in the study area could be negatively affected.

Table 1. Distribution of respondents by major sources of information

Sources	**Frequency**	**Percentage (%)**
Friends and relatives	96	29.91
Radio	126	39.25
Extension agents	30	9.34
Input supply agencies	69	21.5
Total	**321**	**100**

Source: Field survey; 2011

3.2. Major reasons for planting gum Arabic trees by respondents

The study in Table 2 revealed that the most important (29%) reason for planting gum Arabic tree was for economic reason. This was closely followed by fencing material (26.50%). Other reasons for planting gum Arabic trees by respondents were fuel wood, soil conservation and desertification control representing 16.20%, 16.20% and 12.10% of the respondents respectively. The result showed that most of the respondents opted for economic reason. This could not be unconnected with the production of gums for sale, which might improve their livelihoods.

Table 2. Distribution of respondents by reasons for planting gum Arabic trees

Reason	Frequency	Percentage (%)
Economic Reason	93	29
Fuel Wood	52	16.2
Fencing Material	85	26.5
Soil Conservation	52	16.2
Desertification Control	39	12.10
Total	**321**	**100**

Source: Field survey; 2011

3.3. Effects of gum Arabic agroforestry on livelihoods by respondents

The study examined the perception of effects of gum Arabic agroforestry on livelihoods among respondents (Table 3). The result revealed that the respondents' perception on increased crop productivity and increased livestock productivity had a mean score of 2.52 and 2.53 respectively. This implies that they had a neutral perception on the effects of gum Arabic agroforestry on livelihoods in the study area. On the other hand, the respondents' perception on improved environmental situation and improved socio-economic status had a mean score of 2.68 and 2.63 respectively. This implies that the respondents had an agreed perception on the effects of gum Arabic agroforestry on livelihoods with respect to improved environmental situation and improved socio-economic status. Therefore, it could be deduced that the improved socio-economic status could be as a result of the improved environment situation in the study area.

Table 3. Distribution of respondents by effects of gum Arabic agroforestry on Livelihoods

Variable	1*	2*	3*	$\bar{}$
Increased Crop Productivity	24	106	191	2.52
Increased Livestock Productivity	22	106	193	2.53
Improved Environmental Situation	14	74	233	2.68
Improved Socio-Economic Status	17	85	219	2.63

**1 = Disagreed, 2 = Neutral, 3 = agreed* *Source: Field survey; 2011*

3.4. Constraints of gum Arabic agroforestry by respondents

There are many problems associated with the adoption of agroforestry by farmers. This study focuses on the constraints to the adoption of gum Arabic agroforestry in the study area. Some of the constraints examined includes; lack of awareness, skills or knowledge, lack of access to agricultural credit, lack of access to quality gum Arabic seedlings/seeds, poor access to extension services, lack of secure land tenure, vandalism by people, livestock browsing, difficulty in management and pests & diseases (Table 4).

Table 4. Distribution of respondents by Constraints of gum Arabic agroforestry

Constraints	Response			
	1*	2*	3*	$\bar{X}$
(a) Lack of awareness, skill or knowledge	12	42	267	2.79
(b) Lack of access to agricultural credit	16	76	229	2.66
(c) Lack of access to quality gum Arabic seedlings/seeds	10	52	259	2.77
(d) Poor access to extension services	18	80	223	2.64
(e) Lack of secure land tenure	21	82	218	2.61
(f) Vandalism by people	13	46	262	2.77
(g) Livestock browsing	22	84	215	2.6
(h) Difficulty in management	11	30	280	2.84
(i) Pests and diseases	19	88	214	2.61

** 1 = Disagreed, 2 = neutral, 3 = agreed*

The results in Table 4 indicated that all the constraints identified by respondents had a mean score of > 2.56, implying that they agreed to have encountered problems in the adoption of gum Arabic agroforestry in the study area. This is not surprising because gum Arabic agroforestry adoption requires skills and initial relatively huge financial commitment, coupled with problems of livestock browsing in the study area.

4. Conclusion

The perception of the respondents indicated that there was an improvement in environmental situation and socio-economic status due to the adoption of gum Arabic agroforestry technologies as agreed by most of them. The reasons for planting gum Arabic trees were not farfetched i.e for economic reason. The study indicated that gum Arabic agroforestry is a money thriving system of farming, which can serve as a good source of livelihood improvement in the study area especially, when the identified constraints are properly addressed.

5. Recommendations

Based on the findings of the study, the following recommendations were made; -

1) Awareness creation should be mounted through extension education approach to enlighten the public on the skills, knowledge, techniques and benefits of the adoption of gum Arabic agroforestry in the study area.
2) Governments should promote the production of gum Arabic seedlings to be distributed to farmers free of charge through the support of extension services.

3) Farmers in the study area should be encouraged to form gum Arabic agroforestry cooperatives. This will enable them to take advantage of government and non-governmental programmes, such as provision of credit facilities and technologies etc.

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References

Ayuk, E.T. (1997), "Adoption of Agroforestry: The case of live hedges in central plateau of Burkina Faso", *Agricultural System*; Vol. 54, pp. 189-206.

BOSADP (2003), Borno State Agricultural Development programme (BOSADP). Annual Report, Bomo State of Nigeria.

Bishwa, N.R. (2003), Contributions of Agroforestry for Rural Livelihoods: A case of Dhading. District, Nepal. *International Conference on Rural Livelihoods, Forests and Biodiversity* 19 - 23 May, Bann, Germany, pp. 2-18.

Daniel, D., Gilbert, L., David, W., Bruce, M. and William, C. (1996), "Barriers to Adopting Sustainable Agricultural Practices in Uta", *Journal of Extension,* Vol. 34 No. 6.

FAO (2007), Desertification, drought and their consequences, Rome: Food and Agriculture Organization of the United Nations.

Franzel, S.R., Coe, R., Cooper, P., Place, F. and Schert, S.I. (2001), "Assessing the adoption Potential of agroforestry practices in Sub-Saharan Africa", *Agricultural Systems,* Vol. 69, pp. 37-62.

Giroh, D.Y., Wuranti, V., Abubakar, M and Ogwuche. (2008), "Analysis of the Technical inefficiency in Gum arabic based cropping patterns among Farmers in the Gum arabic belt of Nigeria", *Journal of Agriculture and Social Sciences* , Vol. 4 No. 3, pp. 125 – 128.

Gambo, B.A. (2007), Gum Arabic. The Desert Gold. The farmer magazine, Vol. No.1, pp. 3.

Kwesiga, F. K., Akinifesi, F., Mafongoya, P.L., Mc Dermott, M.H. and Agumya, A. (2003), "Agroforestry research and development in Southern Africa during the 1990s: Review and Challenges ahead", *Agroforestry Systems*, Vol. 59, pp. 173-186.

Mark, H. (2003), Nigeria: Gum Arabic Sector Development Programme. A report under the Rural and Agricultural Incomes with a Sustainable Environment (RAISE), pp. 2.

Mukadasi, B. and Nabalegwa, W. (2008), "Extension for Agroforestry Technology Adoption: Mixed Intercopping of Crotalania (crotalania grahamjana) and maize (zea mays L.) in Kabale District Uganda", *Environmental Research Journal,* Vol. 2 No. 3, pp. 131-137.

NPC (2006), National Population Commission (NPC). Provisional Census figures; Ahuja, Nigeria.

Odo, P.E. and Oleghe, P.E. (1998), "The production and management of gum arabic (Acacia senegal) wild in the Sudan and Sahelian zone of Borno state", *Journal of Arid Agriculture,* Vol. 1 No. 2, pp. 157 – 266.